Nephron- Sparing Treatments for Renal Tumors

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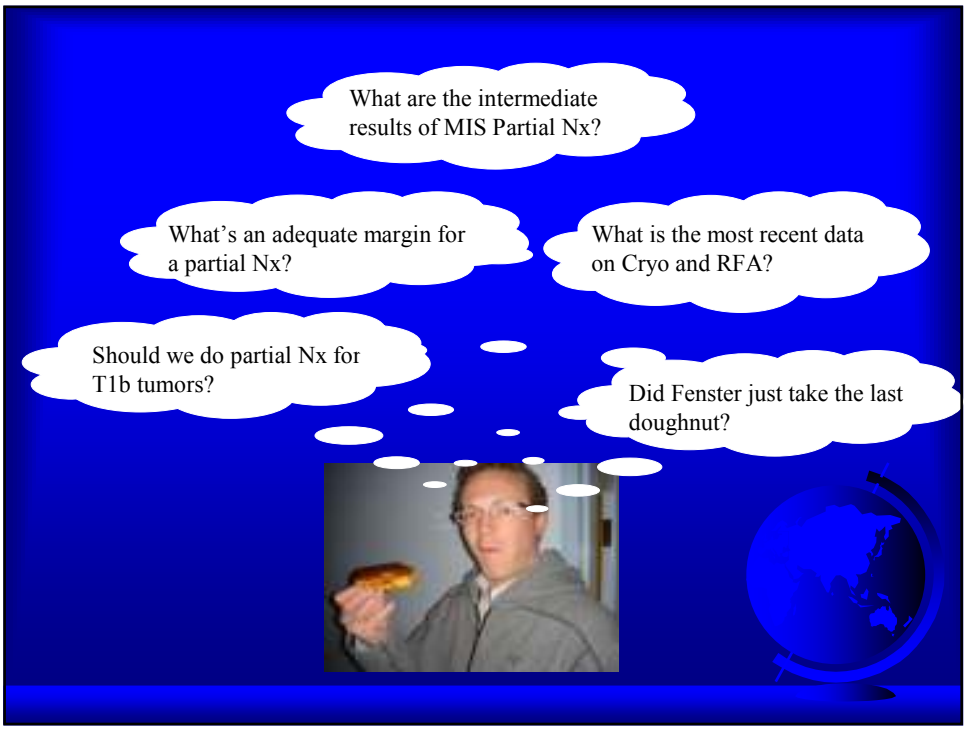


Overview

- History
- Open Partial Nephrectomy
- MIS Partial Nephrectomy
- Cryoablation
- Radiofrequency Ablation (RFA)

History of Partial Nx

Simon

Czerny

- 1869- Gustav Simon
  - 1st planned Nx
- 1884- Wells
  - 1st Partial Nx (accidentally)
- 1887- Vincenz Czerny
  - 1st planned Partial Nx

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

History of Partial Nx

- 1879- 1900:
  - Tillman, Tuffier, Bardenheuer, Paoli
  - experimental feasibility studies
  - Lost favor: fear of Cx

Tuffier in action

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

History of Partial Nx

- 1901-1935: Goldstein and Abeshouse
  - 296 cases, 34 for tumors
  - Polar small-moderate tumors
  - "… contraindicated if opposite kidney was healthy." JU 38:15,1937.

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

History of Partial Nx

- 1950- Vermooten
  - Foundation of modern NSS
  - Autopsy studies (Bell, Hale)
  - Proposed elective NSS

> *"There are certain instances, when it is unwise to do a nephrectomy... The question is, whether such a procedure is ever justifiable when the opposite kidney is normal. I am inclined to think that in certain circumstances it may be."*
>
> JU 64:200, 1950.

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

History of Partial Nx

- 1960s: Significant improvements in NSS
  - Poutasse: segmental blood supply
  - Kerr and Klotz: renal hypothermia
- Partial Nx done in essential cases

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

History of Partial Nx

- mid 1970s:
- Question Rad Nx even if normal contralateral kidney
  - Puigvert
  - Herr
  - Novick
  - Marberger

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

History of Partial Nx

- 1981: Era of elective NSS
  - CT scan detection
  - Kidney reconstruction
  - Renal hypothermia
- Hotly debated

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

History of Partial Nx

- Late 1990s: Standard of Care
  - Improved hemostasis techniques
  - Long term data (10 yr)
    - Herr 1999
    - Fergany 2000

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

History of Nephron-Sparing Tx

- MIS Partial Nx
  - 1993- Winfield: 1st case for LP tic
  - 1994- Gill: RP MIS Partial Nx
- Cryoablation
  - 1995– Uchida: 1st report
  - 1998– Gill: MIS Cryo
- RFA
  - 1997– Zlotta: 1st report
  - 2000-2002: early percutaneous experience

19th C	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000

Nephron-Sparing Tx: Indications

- Absolute ("Imperative")
  - Solitary kidney
  - Bilateral tumors
  - Severe renal insufficiency
- Relative
  - Contralateral kidney threatened by:
    - Local conditions: (eg. stones, infxn, RAS, UPJO)
    - Systemic conditions: (eg. DM, HTN)
    - Genetic conditions: (eg. vHL)
- Elective (Normal Contralateral Kidney)
  - Small (<4 cm; ? <7 cm)
  - Young

Open Partial Nephrectomy

Open Partial Nx- Techniques

- Enucleation
- Polar segmental resection
- Wedge resection
- Major transverse resection
- Ex vivo resection & autotransplant

Technique Overview

- Approach
- Inspection of kidney
- Isolation of vessels
- Cytoprotection
- Adequate resection
- Hemostasis & closure

Technique- Warm Ischemia

WIT (min)	Immed Renal Fxn Loss (%)	Recovery of Renal Fxn
10	Minimal	Complete, min
20	40-50	Complete, hrs
30	60-70	Complete, 3-9d
60	70-80	Often complete, wks
120	100	Incomplete (30-50%)
180	100	None

- 30 min WIT
  (Novick Urol Clin NA 1983, Maessan Transplantation 1988.)
- 90 min (porcine)
  (Laven JU 172: 2471,2004.)
  - Solitary kidney
  - ↓ GFR initial 72 hr
  - GFR normal @ 2 wks
    - @ 1 wk (Baldwin Uro 2004)

Ward BJU 47:17,1975.

Technique– Warm Ischemia

- More functional impairment if:
  - Clamp artery & vein (vs. artery alone) Nadelhaft 1981.
  - Intermittent (vs. continuous) Wilson 1971
  - Manual compression (vs. clamp) McLaughlin 1978
- Enhanced renal tolerance:
  - Solitary kidney
  - Collateral blood supply

Technique– Renal Hypothermia

- Optimum temp 15ºC
  - Canine experiments by Ward 1975
- 20-25 ºC easier to maintain
  - Renal protection for 90 min to 3 hr (Novick 1983)
- Renal surface hypothermia (most common)
- Perfusion hypothermia (equal efficacy)

Technique– Margins

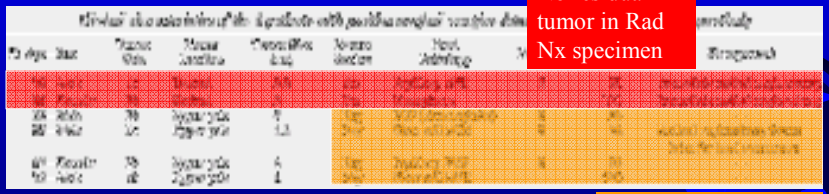
- Frozen section:
  - Method: gross +/- microscopic inspection
  - ? Necessary (Duvdevani JU 173:385,2005; Kubinsky Urology 64:31,2004)
- Size of margin:
  - Traditionally: 1-2 cm
  - Current: **5 mm**
    - possibly even 2 mm

(Sutherland JU 167:61, 2002 ; Porpiglia JU 173,1098, 2005; Gill JU 170:64,2003)

Technique- Margins

JU 173:385,2005

No residual tumor in Rad Nx specimen



3 of 4 no recurrence

Technique— Margins

DOES THE SIZE OF THE SURGICAL MARGIN IN PARTIAL NEPHRECTOMY FOR RENAL CELL CANCER REALLY MATTER?

SUZETTE E. SUTHERLAND, MARTIN I. RESNICK,* GREGORY T. MACLENNAN AND HOWARD B. GOLDMAN

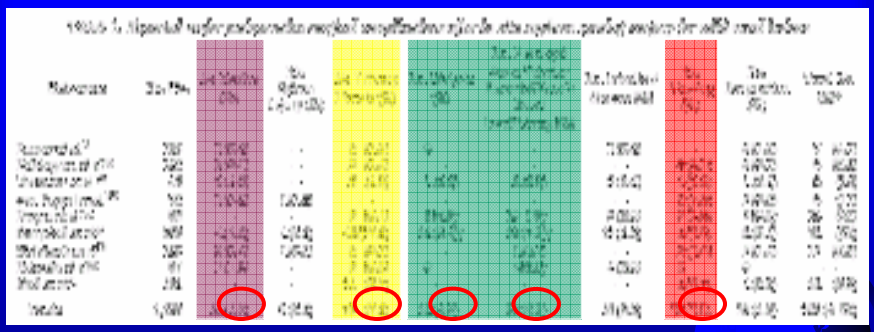
JU 167:61, 2002

- 44 open partial Nx– 41 negative surgical margins
- 49 mo mean f/u
- No local recurrence @ resection site
- Median margin size: **2 mm**
- 42 of 44 cases: <5 mm margin

Technique- Hemostasis

- Suture closure vessels & collecting system
- Argon beam coagulation
- Thrombotic agents:
  - Gelfoam
  - Tisseal
  - FloSeal
  - Surgicel

Complications



Uzzo & Novick JU 2004

NSS Results– Renal Fxn

- Lau et al. JU 163 (Supp 4):153, 2000.
  - Mayo clinic, n=1730 pt
  - Unilateral RCC w/ normal contralat kidney
  - Rad Nx vs. Partial Nx
  - Matched TNM, grade, tumor size, year
  - Progression to renal insuff. (Cr > 2mg/dl)
    - **12.4% Rad Nx**
    - **2.3% Partial Nx** ($p<0.002$)

Open Partial Nx- Results

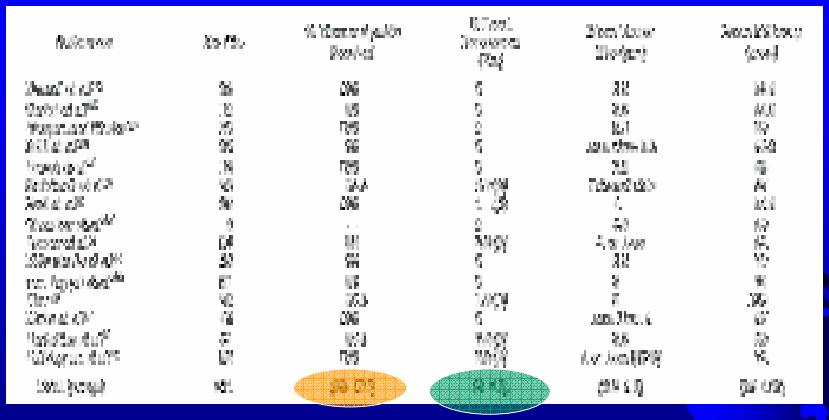
TABLE 2. *Outcome in patients undergoing nephron sparing surgery for sporadic renal cell carcinoma*

References	No. Pts.	% Disease Specific Survival	% Local Recurrence	Mean Followup (mos.)
Jacobs et al[149]	51	84	10	60
Marberger et al[90]	72	78	8	Not available
Smith et al[154]	39	72	8	Not available
Marshall and Walsh[88]	10	90	10	24.5
Bazeed et al[150]	51	96	4	35.8
Carini et al[151]	35	80	3	45.8
Gohji et al[86]	21	100	0	Not available
Morgan and Zincke[152]	104	80	6	60
Selli et al[153]	56	90	4	46.2
Provet et al[15]	44	88	2	36
Steinbach et al[16]	121	90	4.1	47
Moll et al[21]	142	98	1.4	34.8
Thrasher et al[147]	21	100	0	40
Lerner et al[18]	185	80	5.9	44
D'Armiento et al[87]	19	95	0	70
Indudhara et al[93]	35	100	0	37
van Poppel et al[148]	76	96	0	75
Hafez et al[27]	485	92	3.2	47
Barbalias et al[85]	41	97.5	7.3	59
Belldegrun et al[25]	146	93	2.7	74
Lee et al[20]	79	96	0	40
Total (range)	1,833	(72–100)	(0–10)	(24–75)

> 90% in recent series

Uzzo & Novick JU 2001

Results– Elective NSS



Long-term Results

- Fergany. JU 163:442, 2000.
  - CCF, sporadic RCC
  - N=107
  - 90% partial Nx imperative indications
  - Min. 10 yr f/u

	% 5 Yr survival	% 10 Yr survival
Overall	88.2	73
< 4cm	98	92

- Herr. JU 161:33,1999.
  - MSK
  - N=70
  - Small tumors w/ normal contralat kidney
  - Mean size: 3 cm
  - Mean f/u: 10 yrs
  - 97 % cancer free survival

Partial vs Radical Nx

References	Nephrectomy/Nephron Sparing Surgery	
	No. Pts.	% Cancer Specific 5-Yr. Survival
Lerner et al[18]	209/185	89/89
Barbalias et al[68]	48/41	98.4/97.5
Belldegrun et al[28]	125/108	91.2/98
Indudhara et al[93]	71/85	94/91
Butler et al[17]	42/46	97/100
D'Armiento et al[67]	21/19	96/96
Lee et al[20]	183/79	95/95

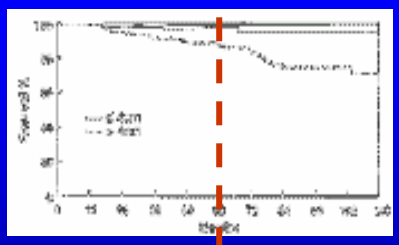
- Retrospective
- Controlled for:
  - Age
  - Gender
  - Tumor size
  - Stage
  - Grade

Tumor Location

- Central vs peripheral
- Technical considerations
  - Longer clamp time
  - Collecting system repair
- Not prognostic indicator of outcome
  - Renal function
  - Local tumor recurrence
  - 5 yr cancer specific survival

Hafez et al JU 159:1156, 1998.
Black et al JU 163: 737, 2000.

Tumor Size: 4 cm cutoff



5 yr cancer-specific survival 96% vs 86% (p=0.001)

- Hafez et al. JU 162: 1930, 1999.
  - CCF, 485 patients
  - 4 cm cutoff
  - Lower recurrence rate
    - 5% vs. 16% (p= 0.001)
  - Not T1a vs T1b though
    - 50 of 175 pts in >4cm group were >T1
  - No control group undergoing Rad Nx

Partial vs Rad Nx: 4-7 cm

	NSS	Rad Nx
5 yr cancer specific survival	98 %	86%
5 yr recurrence free survival	93%	98%

- Leibovich et al.

JU 171:1066,2004.

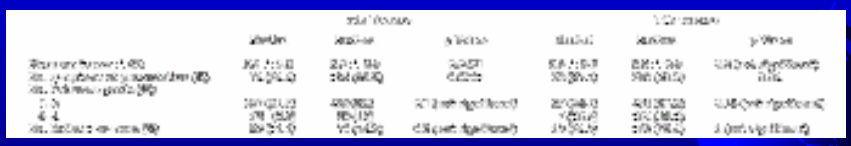
- Mayo Clinic
- Retrospective
- Hetergeneous:
  - Mean tumor size
  - TNM path stage
  - Histo subtype

Partial vs Rad Nx– T1a/b

SAFETY AND EFFICACY OF PARTIAL NEPHRECTOMY FOR ALL T1 TUMORS BASED ON AN INTERNATIONAL MULTICENTRIC EXPERIENCE

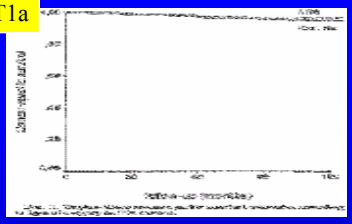
Patard et al. JU 171:2185,2004.

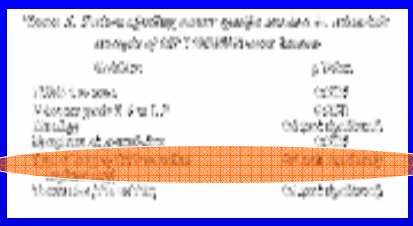
- 7 international centers (Europe & UCLA)
- n= 1454, pathological T1
- Mean f/u: 62.5 mo

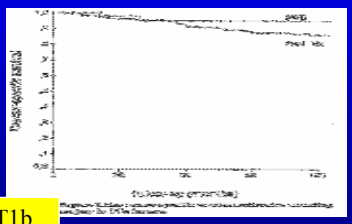


Open Partial vs Radical Nx- T1a/b Cancer Specific Survival

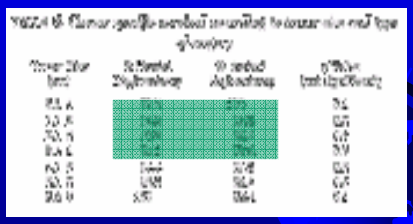
T1a







T1b



Open Partial vs Rad Nx– T1a/b Recurrence

TABLE 3. *Analysis of type of recurrence according to tumor size and type of surgery*

	No. T1a Tumors (%)	No. T1b Tumors (%)
No. partial nephrectomy (p = 0.2)		
No recurrence		
Local recurrence	1 (0.6)	1 (3.6)
Distant recurrence	3 (1.8)	2 (7.1)
No. radical nephrectomy (p = 0.001)		
No recurrence	156 (94.6)	179 (82.1)
Local recurrence	1 (0.6)	5 (2.3)
Distant recurrence	8 (4.8)	34 (15.6)
p Value	0.6 (not significant)	0.5 (not significant)

Partial Nx: T1a vs T1b No difference

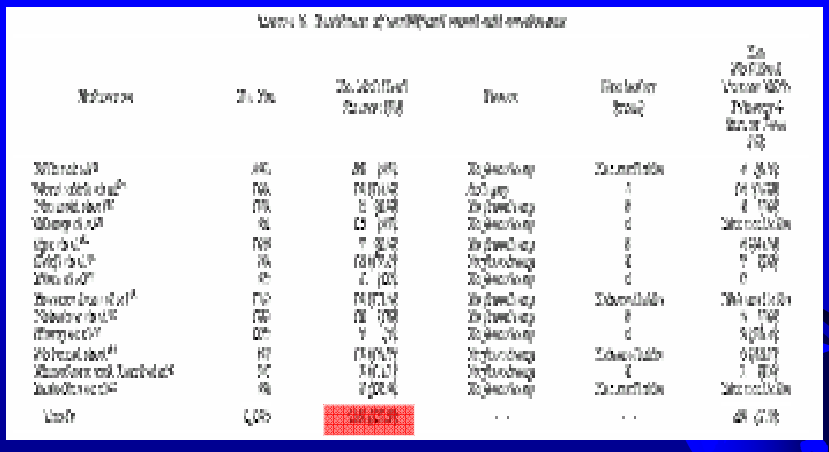
T1a: Partial vs Radial Nx No difference

T1b: Partial vs Radial Nx No difference

NSS- Local Recurrence

- Incomplete resection of tumor
- Occult multifocal disease
- Development of new 1° or metastatic focus

Results– Multifocal RCC



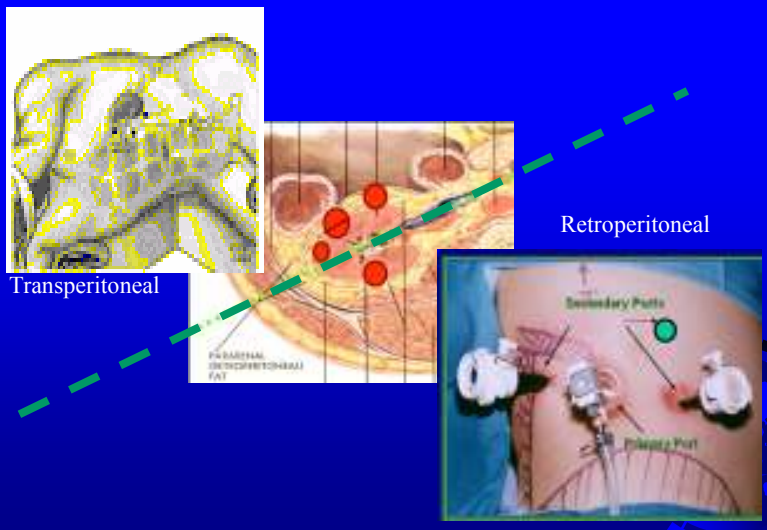
Stage, grade, histological subtype

Open Partial Nx– Results Summary

- NSS for T1a (<4cm)
  - Equivalent oncological efficacy
  - 90-100% cancer specific survival
  - Renal function preserved
  - Multifocal RCC: 5%
  - Local Recurrence: 0-7%
- ? Expand indications to T1b

Laparoscopic Partial Nephrectomy

Technique– Approach



Laparoscopic Ultrasound

- Endophytic, central
- Lower positive margin
  - 14% vs. 3%

    Wash U: Ames JU 171(4 suppl), 2004
- ? Multifocal tumor
  - No advantage compared to pre-op CT

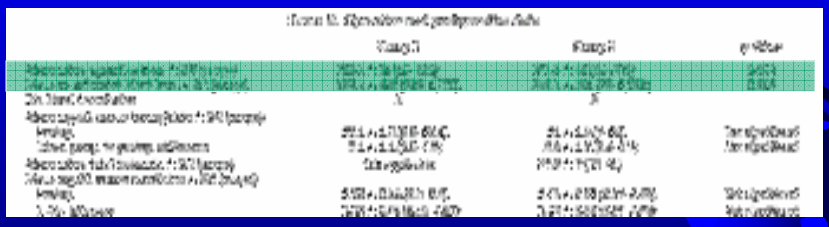
    Campbell et al. JU 155:1991, 1996.

Technique– Hypothermia

- If expect WIT >30 min
- Surface contact renal hypothermia
  - Endocatch II bag (Gill et al. JU 170:52,2003.)
- Intra-arterial iced RL (Janetschek. JU 171,2004)
  - Angiocath into renal artery via femoral
- Retrograde endoscopic
  - Ureteral access sheath (Landman. Urology 2003)

Technique- Hilar Clamping

- Montsouris, France. JU 169:483,2003.
  - Retrospective, n=28
  - Group 1 (no clamp, ultrasonic & bipolar)
  - Group 2 (clamp, ureteral catheter cooling)



Technique– Hemostasis

- Tourniquets (w/o hilar clamping)
  - Regional hypoperfusion
  - Cable-tie, double-loop & Vicryl mesh
  - Peripheral/polar tumors
  - Unreliable
- Argon beamer
- Tissue sealants
  - ↓ hemorrhage & urine leak (Spaliviero.CCF. JU 171(4 suppl),2004)

Technique- Hemostasis

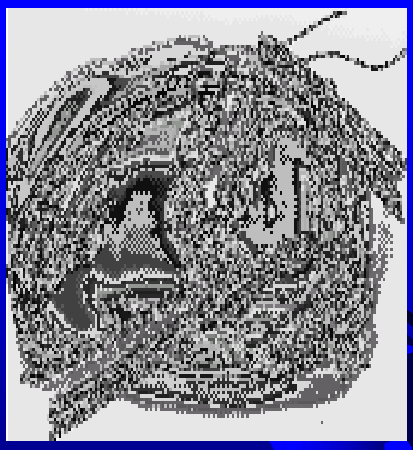
- Coagulative Energy
  - Animal studies: Water-Jet dissector, Laser
  - Suboptimal: Ultrasonic, Bipolar, Microwave
  - RF Coagulation: peripheral tumor

(Winfield J Endo 2005; Cadeddu AUAUS 2004)

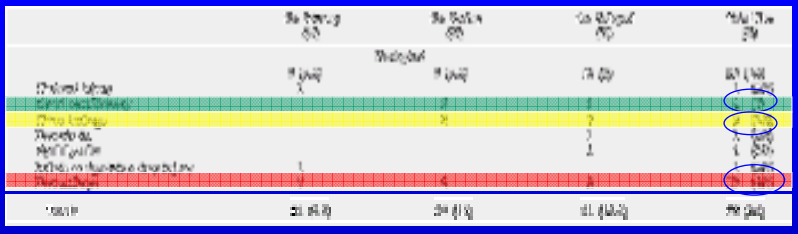
- **Standard**: **Suture closure reconstruction**
  - Especially larger & central lesions

Technique- Closure

- Watertight closure collecting system
- Vessels
- Floseal
- Surgicel ‘cigar’
- Sutures w/ Hem-o-Lok clips or LapraTy



MIS- Complications



Ramani. JU 173:42,2005.

- CCF. n=200, 25% central, 71% pelvicaliceal repair
- 7.5% solitary, Open conversion in 1%
- Floseal: ↓ hemorrhage to 3%, ↓ urine leak to 1.5%

Gill et al. Uro 65,2005.

MIS- Central Tumors

- Conversion
  - Open Partial (1)
  - MIS Rad Nx (1)
- Early Post-Op Cx
  - Hemorrhage (3.9%)
  - Urine leak (1.3%)

	Central	Peripheral
N	154	209
Size (cm)	3.0 (1-7)	2.4 (0.7-10)
WIT(min)	33.5	30
+ Margin	0.8%	0.7%
IntraOp Cx	5.2%	4.8%
Early Postop	5.8%	1.9%
Late Postop	7.8%	7.7%

Frank. CCF. JU 175:849, 2006.

MIS– Oncological Results

	CCF JU 175:459,2006	Hopkins JU 172:871,2004
No RCC	68	48
F/U (mo)	42	37
Size (cm)	2.9	2.4
# Pos Margins	1	1
Cancer-specific survival (%)	100	100
# local recurrences	0	2 (1 vHL, 1 remote)

COMPARATIVE ANALYSIS OF LAPAROSCOPIC VERSUS OPEN PARTIAL NEPHRECTOMY FOR RENAL TUMORS IN 200 PATIENTS

- Gill vs Novick.

  JU 170:64, 2003.
- Retrospective
- Post-op renal fxn
  - No difference

	MIS	Open
† Size (cm)	2.8	3.3
† Solitary	41%	54%
† WIT (min)	27.8	17.5
† EBL (cc)	125	250
† IntraOp Cx	5%	0%
† GU Cx	11%	2%
Pos Margin	3%	1%
† LOS (days)	2	5

MIS Partial Nx– Summary

- Technically challenging
- Technique evolving
- Intermediate oncological efficacy similar
- Vs. Open:
  - ↑ Intraoperative Cx
  - ↑ GU Cx

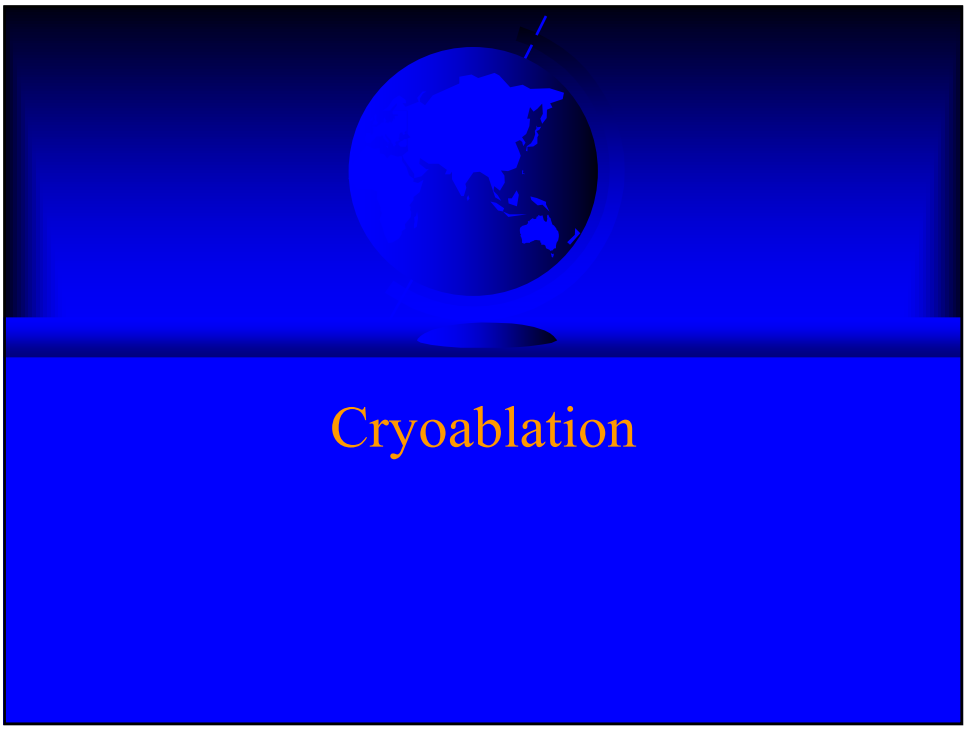
Ablation

Ablation– Indications

- Advanced age
- Limited life expectancy
- High operative risk/ Refuse surgery
- Multifocal RCC (eg. vHL)
- Solitary kidney
- Small (<3 cm), exophytic

Ablation Options

- **Cryoablation**
  - Open
  - MIS
  - Percutaneous
- Thermal Ablation
  - **Radiofrequency Ablation (RFA)**
  - High Intensity Focused Ultrasound (HIFU)
  - Microwave
  - Laser Induced Thermotherapy (LITT)
  - Interstitial Photon Radiation Ablation



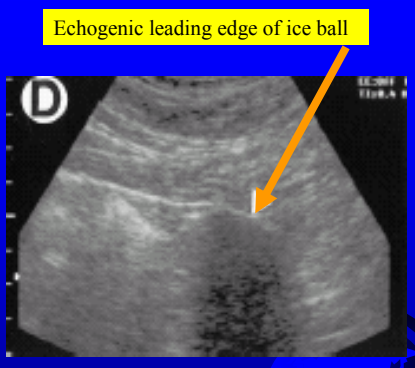
Cryoablation

Cryoablation- Mechanism

- Direct cytotoxic injury:
  - Intracellular ice crystals → Hyperosmolar environment
  - Cell dehydration, shrinkage, enzyme denaturation, cytoskeleton & membrane dysfunction
- Indirect ischemic injury
  - Occlusion of local tissue microvasculature
- "Freeze/ Thaw" cycle (Wooley et al. J Endourology 16:519,2002)
  - Rapid freeze, then gradual thaw
  - Maximizes effect

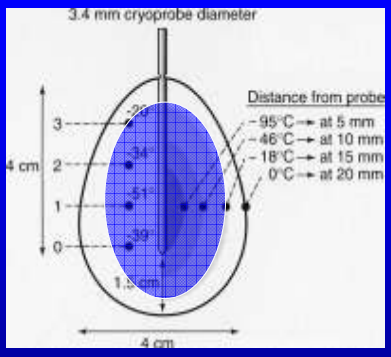
Cryoablation– Technique

- Approach
- Imaging
- Bx
- 2.4 -4.8 mm cryoprobe
- Double freeze/ thaw
  - Freeze: Liquid N or Ar
  - Thaw: Passive, He gas



Gill JU 173: 1903, 2005. Nadler JU 170:1121, 2003. Gupta JU 175:447, 2006.

Cryoablation- Ice Ball



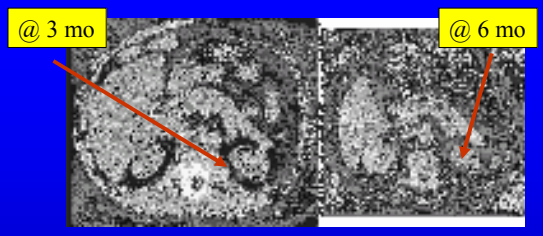
- -19.4ºC needed
- U/S, CT, or MRI
- Ice ball overrepresents actual area of ablation
- Aim for ice ball 1 cm greater than tumor
  - Minimum 3.1 mm
    (Campbell et al. Urology 52:29, 1998)

Chosy JU 159:1370,1998. Gill JU 173: 1903, 2005.

Cryoablation– Efficacy

- Confirmed tumoricidal effects
  - Acute (Edmunds et al. J Endourol 14:139,2000.)
  - Chronic (Jang et al. JU 173:720, 2005.)

Post Cryoablation Imaging

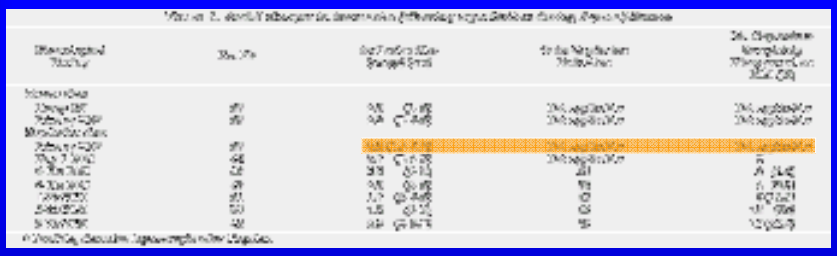


- CT or MRI
- Non-enhancing
  - Transient rim enhancement @ 1-3 mo
  - Bx: no RCC
  - ? Reactive changes
- Same or decrease in size

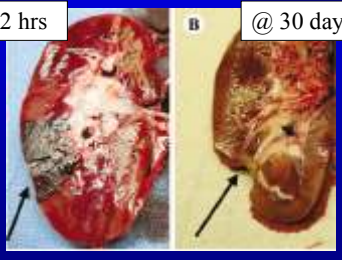
Shingleton. JU 165.2001. Gill. JU 173:1903.2005.

Shrinkage

Shrinkage



@ 2 hrs



@ 30 days

Cryoablation– Results

RENAL CRYOABLATION: OUTCOME AT 3 YEARS

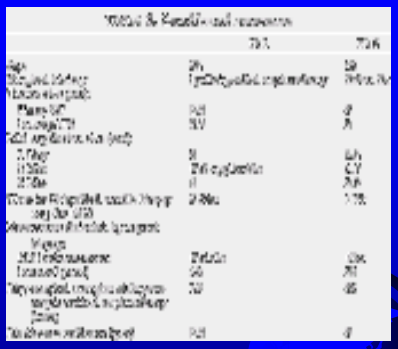
INDERBIR S. GILL,*† ERICK M. REMER, WALEED A. HASAN, BRENDA STRZEMPKOWSKI, MASSIMILIANO SPALIVIERO, ANDREW P. STEINBERG, JIHAD H. KAOUK, MIHIR M. DESAI AND ANDREW C. NOVICK

JU 173:1903,2005.

- 56 pts w/ 3 yr f/u
- Mean tumor size: 2.3 cm (1-5 cm)
- 2 lesions (3.6%) abutting collecting system
- Routine 6 mo post-op Bx in 39 pts (70%)

MIS Cryo 3 yr f/u

- 98% 3 yr cancer-specific survival
- 2 local recurrences (5.6%)
  - Neg routine Bx
  - New MRI enhancement
- Renal fxn– no change



Percutaneous Cryoablation

- MRI guided
  - Shingleton and Sewell. Mississippi. JU 165:773,2001.
  - 22 tumors, 20 pts
  - Mean tumor size: 3 cm (1.8-7 cm)
  - No OR Bx, 2 or 3 mm probe, 3 freeze-thaw
  - Anterior location 20% -- no bowel injuries
  - Mean f/u: 9.1 mo (3-14)
  - No recurrences
    - (1 pt retreated b/c VHL)

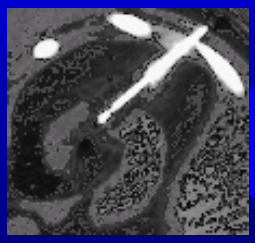
Shingleton

Percutaneous Cryoablation

- CT guided
  - Hopkins. JU 175:447, 2006.
    - N=27 lesions (20 pts)
    - Conscious sedation
    - Size: 2.5 cm
    - 1 pt required pRBC
    - 16 lesions f/u 6 mo
    - 15/16 no enhancement
  - Small, non-central lesions

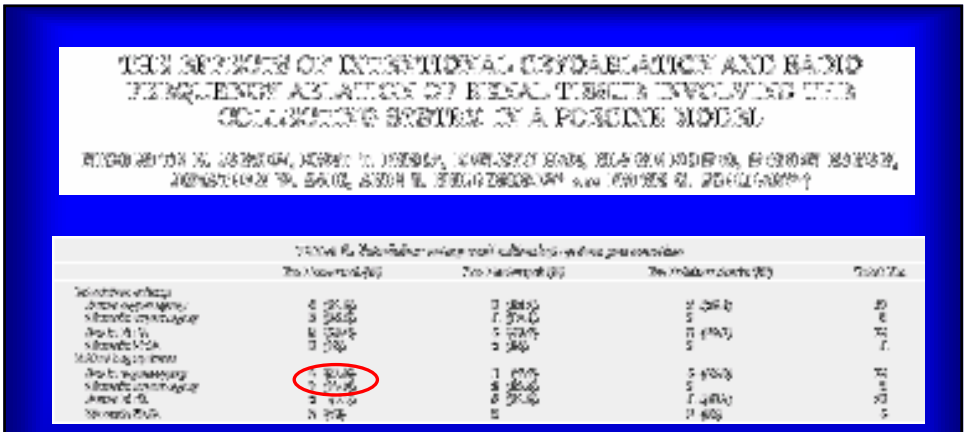
Su

- U/S guided
  - Bassignani JU 171, 2004.
    - N=4
    - GA
    - No periop Cx



Complications

- Major/ Bleeding (<1%) JU 172:874,2004.
  - Use smaller probes
  - Refreeze
  - Floseal, Surgicel, Argon beam
- Pain/Paresthesia @ probe site
- ?Collecting system
  - Initial prostate cryoablation: urethral sloughing



- No GU fistulas, urinomas
- Similar findings to Sung et al. (JU 170: 619, 2003)
  - Urothelium regrowth @ 1 month
  - Pelvicaliceal warming: no histological difference

Cryoablation– Summary

- Small <3cm
- Non-central lesions
- Monitor ice ball
- Minimal morbidity
- Early f/u: >90% recurrence free

Radiofrequency Ablation (RFA)

RFA– Mechanism

- High frequency electrical current
- Excitation ions
- Frictional heat
- Denature proteins & membrane bilayer
- Need tissue temp >50ºC

RFA– Technique

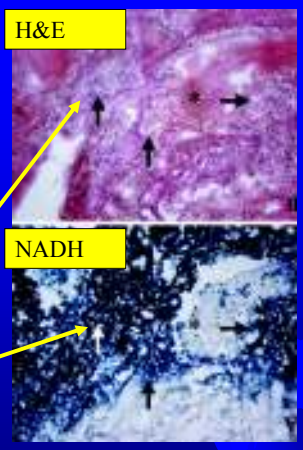
- Open, MIS, Perc
- Difficult to image RFA effect during Tx
- 200 W, Probe tip temp 105-110ºC
- Reduce tissue impedence:
  - Wet RFA
  - Internal cooling (CoolTip probe)
  - Multiple tine electrodes
  - Temperature sensing; Impedence monitoring

RFA– Ablate & Resect

- Rendon et al. UofT. JU 167:1587,2002.
  - RFA then immediate or delayed Nx
  - Mean size: 2.4 cm, N= 11 lesions
  - Viable tumor on pathology (H&E):
    - 4 of 5 in acute group
    - 3 of 6 in delayed group
    - 5-10 % viable tumor at margins of Tx areas
  - Non-enhancing lesions: 2 of 3 had tumor
  - 100 W probe, ? Tissue temp

RFA– Ablate & Resect

- Michaels. Lahey Clinic.
  - 15 patients, 20 tumors
  - Open RFA → immediate Partial Nx
  - Size: 2.4 cm (1.5-3.5 cm)
  - H&E: All 20 — viable tumor w/in RFA lesion
  - NADH:
    - 4 of 5 viable tumor



JU 168:2406, 2002.

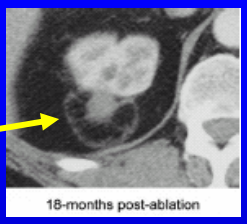
RFA– Histological Effect

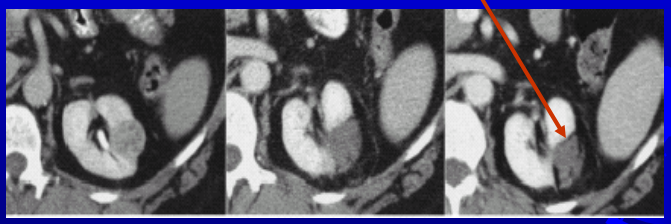
- "Viable" tumor foci early post RFA
  - Full effect of RFA may require more time
  - Cellular changes continue 30-90 days post-RFA
- Accuracy of H&E:
  - Overt histo destruction may not be seen acutely
- NADH: cell viability (Marcovich et al. LIJ. JU Oct 2003.)
- No long-term post-RFA histo studies

Gill. Urology 56:197,2000.

RFA– Postablation Imaging

- Low density, wedge-shaped
- Minimal shrinkage
- Fibrotic halo of fat (exophytic)
- Fat infiltration (50%) (endophytic)





Matsumoto. JU 172:45,2004

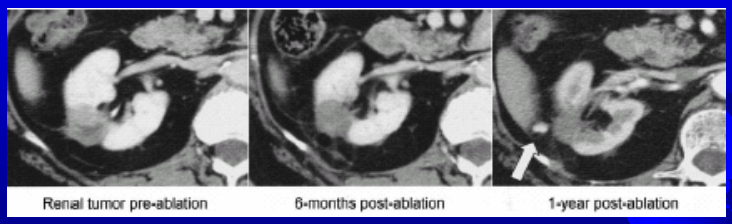
RFA— Early data

	Date	N	Size (cm)	F/U (mo)	'Success'
Ogan	2002	13	2.4	4.9	93% (CT)
Pavlovich	2002	24	<3	2	79% (CT)
Roy-Choudhury	2002	15	3.0	13.6	87%
Su	2003	35	1.9	3.2	95% (CT)
Gervais	2003	42	3.2	42	100% exophytic 5/11 central

RFA– New Data

- Matsumoto et al. SouthWestern. JU 172:45,2004.
  - 64 tumors, Perc(34)/ MIS(28)/ Open(2)
  - F/u 13.7 mo
  - 97% (62/64) nonenhancing

Cadeddu



RFA– New Data

- Hwang et al. NIH. JU 171:1814, 2004.
  - 17 pts, hereditary RCC, 24 tumors
  - 2.26 cm
  - F/U: 1 year
  - 23 of 24 (96%) non-enhancing post RFA

RFA– New Data

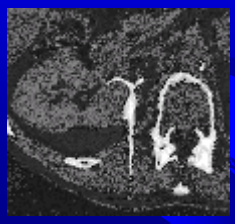
- Gervais et al. MGH.

  AJR.185:64,2005.

  - 100 tumors
  - CT-guided percutaneous RFA
  - Size: 3.2 cm (1.1-8.9 cm)
  - Mean F/U: 2.3 yrs
  - 90% non-enhancing post RFA

Gervais

McDougal



Gervais et al. 2005

- Location:
  - Exophytic– 100% (67/67)
  - Central– 78% (7/9)
  - Mixed– 61% (11/18)
- Size:
  - <3 cm: 100% (4/52 needed 2 RFA sessions)
  - 3-5 cm: 92% (17/36 needed 2 or 3 RFA sessions)
  - >5 cm: 25% (2/2 needed 2 or 3 RFA sessions)
    - Note: no tumors >5.5 cm completely ablated

RFA– Complications

- Low morbidity (9.2% minor Cx) Johnson. JU 172:874,2004. Gervais AJR:185,2005.
  - Most common: pain/paraesthesia @ probe site
- <2% major Cx:
  - Bleeding, UPJ obstruction, urine leak
- No bowel injury
  - Patient selection
  - 7 bowel perfs in 3500 RFA liver Radiology 226:441, 2003.

RFA– Complications

- ?Collecting system (Janzen. UCLA. JU 173/l1368, 2005)
  - Swine model
  - High rate urothelial damage acutely (60-90%)
  - @ 30 days, intact urothelium
  - No clinical fistula/urinoma
  - 2% ureteral injury (Gervais AJR 185,2005)

RFA– Summary

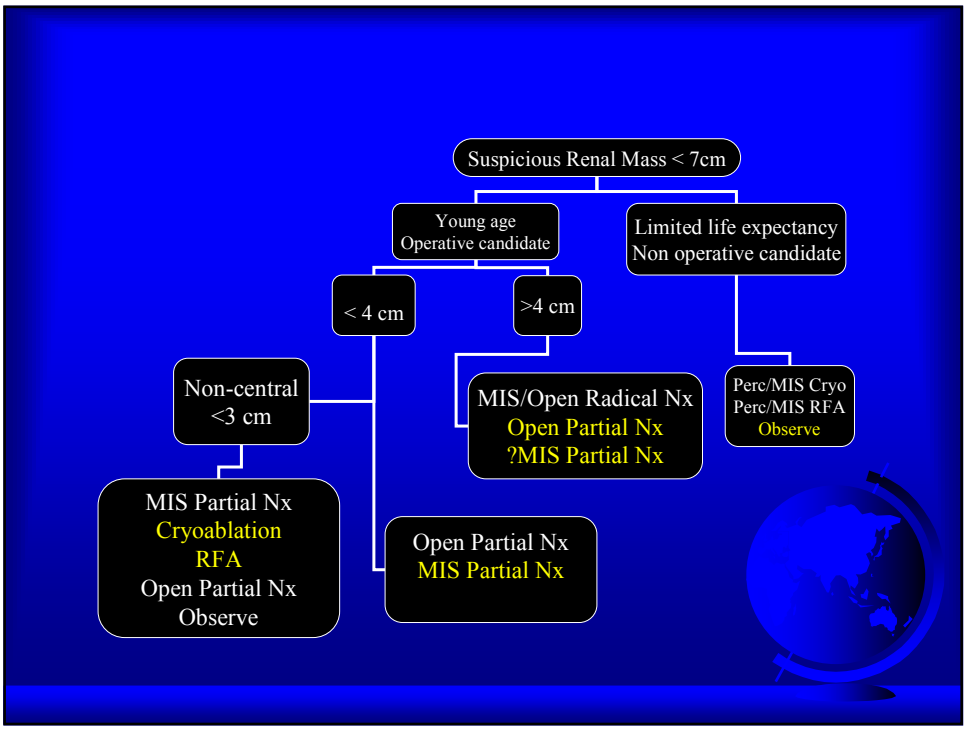
- <3 cm
- Non-central
- Minimal morbidity
- Early f/u: >90 % recurrence free
- Multiple RFA treatments may be needed

Cryo vs RFA

- ↓ intraoperative pain
- Monitor ice ball
- Confirmed acute & chronic tumor kill
- ? ↓ collecting system injury

- More hemostatic
- Lower cost
- ↓ probe site pain

Gupta JU 2006. Collyer J Am Coll Surg 193:2001.


Suspicious Renal Mass < 7cm
Young age
Operative candidate
Limited life expectancy
Non operative candidate
< 4 cm
>4 cm
Non-central
<3 cm
MIS/Open Radical Nx
Open Partial Nx
?MIS Partial Nx
Perc/MIS Cryo
Perc/MIS RFA
Observe
MIS Partial Nx
Cryoablation
RFA
Open Partial Nx
Observe
Open Partial Nx
MIS Partial Nx


Should I do a fellowship in Interventional Radiology?
Should I learn how to do MIS Partial Nx or will ablation be the way to go?
Should we be even treating small renal lesions? Or should we observe them?
Should I do an open partial Nx or an MIS radical Nx?